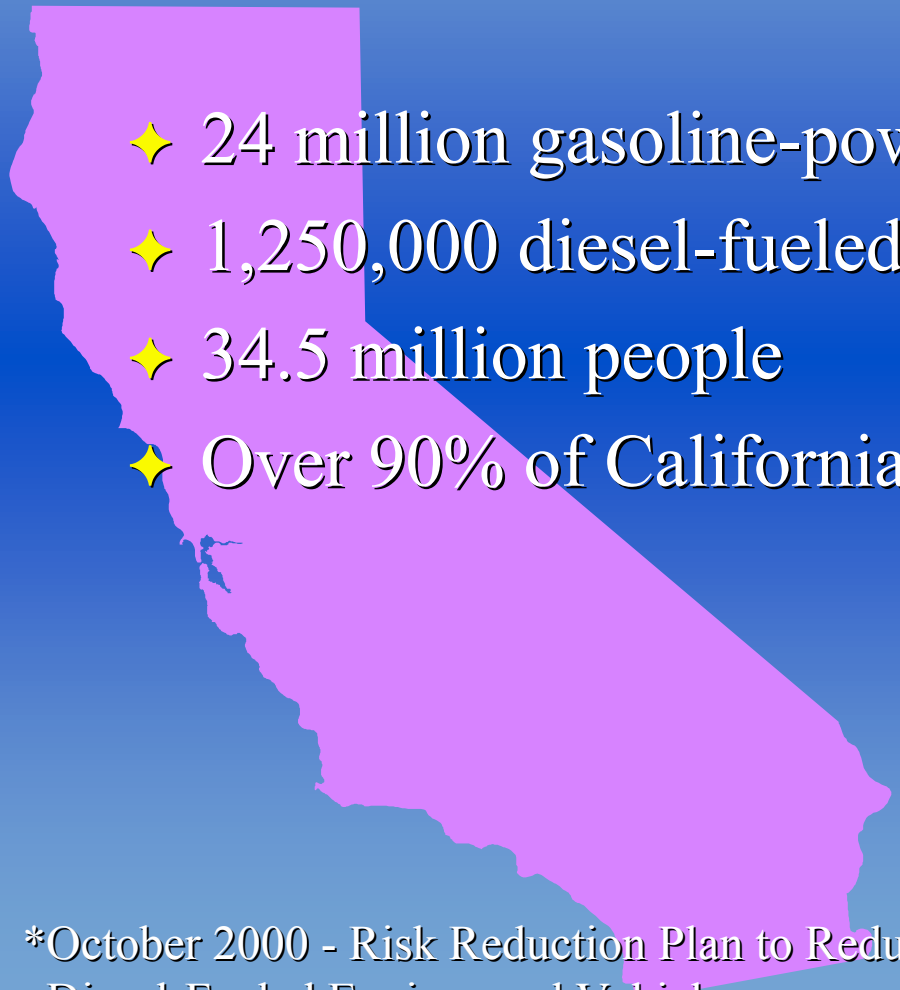
Overview of California's Transportation Fuel Specifications

June 28, 2004

California Environmental Protection Agency

Air Resources Board

California's Air Quality Problem

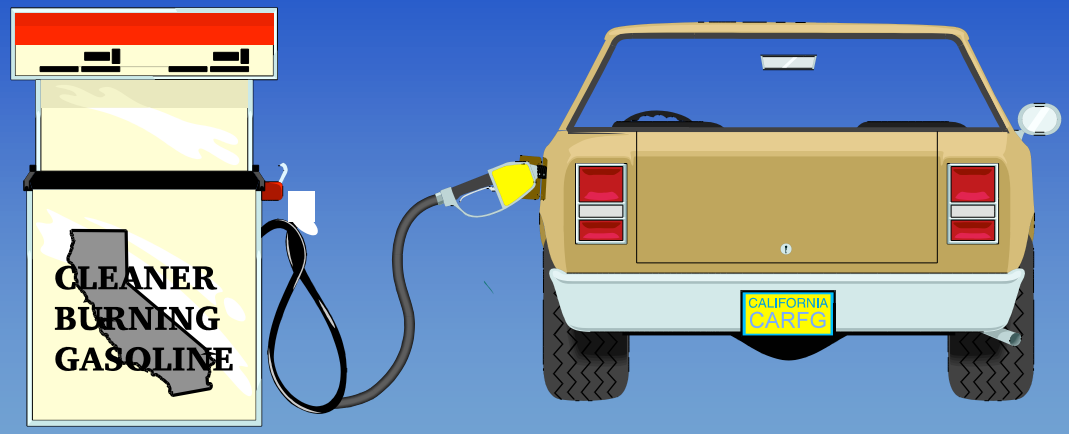


- 24 million gasoline-powered vehicles
- 1,250,000 diesel-fueled vehicles and engines*
- 34.5 million people
- Over 90% of Californians breath unhealthy air

*October 2000 - Risk Reduction Plan to Reduce PM Emissions from Diesel-Fueled Engines and Vehicles

Motor Vehicle Fuels Control Strategy

- Treat vehicles and fuels as a system
  - Vehicle emission standards
  - Fuel standards
  - Include lubricants
- Flexible



Legislative Requirements
California Health and Safety Code

- Section 43018:
  - Achieve maximum feasible reductions in PM, CO, and toxic air contaminants
  - Achieve maximum emission reductions of VOC and NOx by earliest practicable date
  - Adopt most effective combination of control measures on all classes of motor vehicles and their fuels
- Section 43013: MTBE Removal

California's Vehicle Fuels Programs

Year Adopted	Gasoline	Diesel	Alternative Fuels
1971	Reid Vapor Pressure	-------	-------
1975	Sulfur	-------	-------
1976	Lead	-------	-------
1981	-------	Sulfur (SCAB)	-------
1988	-------	Sulfur/Arom. HC	-------
1990	Phase 1 RFG	-------	-------
	-------	-------	Clean Fuels/LEV
1991	Phase 2 RFG	-------	-------
	Wintertime Oxygenates	-------	-------
1992	-------	-------	Commercial and Certification Specs
1994	Phase 2 RFG Predictive Model	-------	LPG (amended)
1998	Wintertime Oxygenates (amended)	-------	LPG (amended)
1999	Wintertime Oxygenates (amended)	-------	Clean Fuels (amended)
2000	Phase 3 RFG(eliminates MTBE)		
2003	---------	Sulfur 15 ppm	--------

California and Federal Diesel Fuel Regulations

Comparison of Federal and California Diesel Specifications

Property	California	Federal
Sulfur		
Current	500 ppmw	500 ppmw
June 2006	***15 ppmw***	***15 ppmw***
Aromatic Hydrocarbons		
Large Refiners	10 Vol. %	---
Small Refiners	20 Vol. %	---

- Applicability
  - California: on- and off-road vehicles (stationary sources-2006)
  - Federal: on-road vehicles only

California's Diesel Fuel Regulatory Flexibility

- Regulation allows companies to certify emission equivalent alternative formulations
- Approximately twenty-five formulations certified to date
- Most diesel fuel produced to alternative fuel formulation

Average Specifications of Reformulated Diesel Fuel

Specification	California Pre-1993	California 1999	U.S.[1] 1999
Aromatics, vol%	35	19	35
Sulfur, ppmw	440[2]	140[3]	360
Cetane No.	43	50	45
PNA	---	3	---
Nitrogen	---	150	110

1. AAMA National Fuel Surveys
2. For Los Angeles area (Greater than 3000 ppm in rest of California)
3. About 10 % of total California volume is < 15 ppmw

Federal Regulatory Standards and Phase-In of Sulfur Requirements

Date	Standard
October 1, 1993	500 ppm (max)(on-road)
June 1, 2006	15 ppm (max) (on-road)
(Initiate)	
June 1, 2007	500 ppm (max) (non-road)
January 1, 2010	15 ppm (max)(on-road)
June 1, 2010	15 ppm (max) (non-road)
June 1, 2012	15 ppm (max) (loco/marine)

California and Federal Gasoline Regulations

CaRFG3 Specifications

Property	Flat Limits	Cap Limits
RVP, psi	7.0(1)	6.4-7.2
Benzene, vol%	0.80	1.10
Sulfur, ppmw	20	60/30(2)
Aromatic HC, vol%	25	35
Olefins, vol. %	6.0	10
Oxygen, wt. %	1.8 to 2.2	0-3.7(3)
T50 °F	213	220
T90 °F	305	330

1) Equal to 6.9 psi. if using the evaporative element of the Predictive Model

2) 30 ppmw. will apply December 31, 2004

3) Allow 3.7 for gasoline containing no more than 10 volume percent ethanol

California's Gasoline Regulatory Flexibility

- Flat or Average Limits
- Produce formulation certified as equivalent through:
  - Emissions testing
  - Predictive model (flat or average limits)
    - Exhaust
    - Evaporative
- Essentially all California reformulated gasoline is now being produced using the Predictive Model

Implementation of CaRFG3

- California refining industry phased-out MTBE at the end of 2003
- All refiners are producing California Phase 3 RFG
- Ethanol Consumption
  - About 900 million gallons
- Almost all ethanol imported from the Midwest

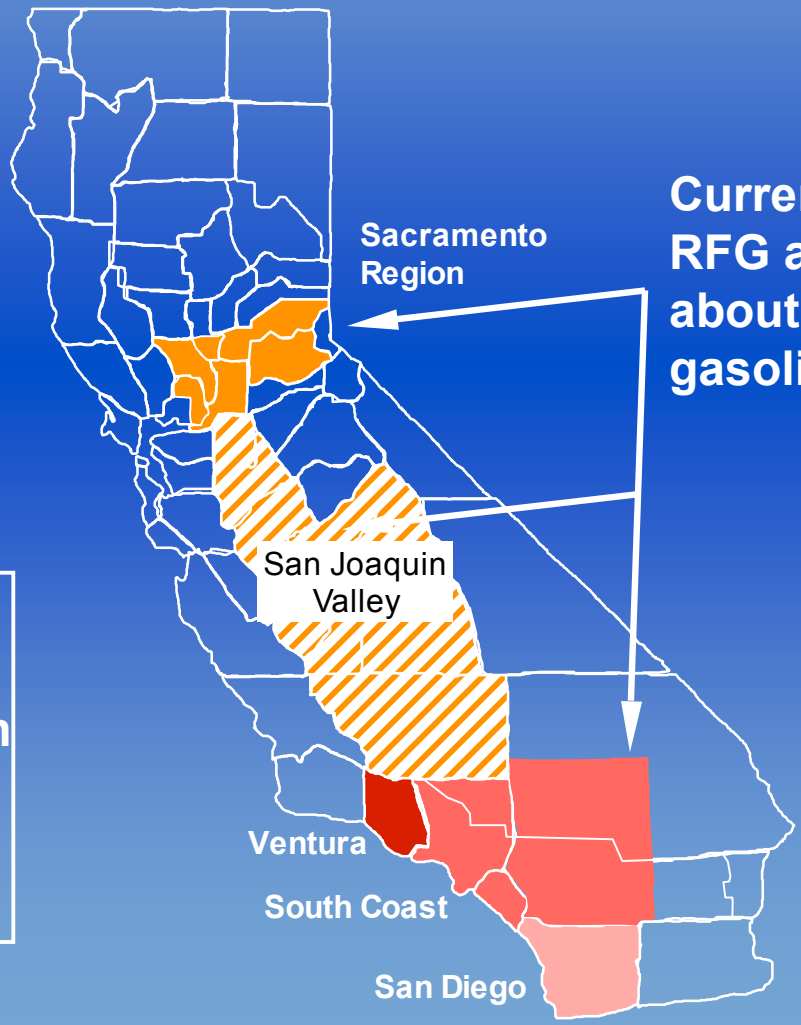
Federal Reformulated Gasoline (RFG) Program

- Required by 1990 CAAA in severe and extreme ozone non-attainment areas
- Minimum oxygen requirement of 2.0 weight percent
- Performance based fuel standards
- Phase 1 federal RFG
  - Required as of January 1, 1995
- Phase 2 federal RFG
  - Required January 1, 2000
- Nationwide sulfur standard (Tier II)
  - 30 ppm average with 80 ppm cap limit

Federal Regulatory Standards and Phase-In of Sulfur Requirements

Date	Standard
April 1, 2000	Federal Phase 2 RFG
January 1, 2004	300 ppm (max) SULFUR
	120 ppm (corp. pool avg.)
January 1, 2005	90 ppm (corp. pool avg.)
	30 ppm (refinery avg.)
January 1, 2006	80 ppm (max)
	30 ppm (avg.)

Federal Minimum Oxygen Requirement Affects Most of State



Current Federal RFG areas affect about 80% of gasoline sold

Federal RFG Areas

1991 - San Diego
South Coast Region
Ventura

1995 - Sacramento Region

2002 - San Joaquin Valley

Potential Modifications to the CaRFG Regulations

Potential Further Amendments to the CaRFG Regulations

- New SIP Commitments:
  - October 2003 SIP Hearing
  - Additional emissions reductions needed to meet ozone goal.
- Include examination of gasoline specifications

Potential Further Amendments to the CaRFG Regulations

With the development of advanced emission control technologies there may be opportunity to increase synergies between the California gasoline specification and the new emission control technologies.

Staff would also like to consider whether there are possible changes that could be made to the CaRFG regulations that could increase efficiencies within the California refinery industry will preserve existing benefits and enforceability.

Potential Further Amendments to the CaRFG Regulations

- Strawman Concept - For discussion purpose only
  - Replace Flat Limits and Averaging Limits with new set of caps.
  - Predictive Model could be used to determine new caps
  - Distillation Temperatures limits could be replaced by a new Drivability Index

CARB DIESEL FUEL

Considering Regulatory Requirements for:

Intrastate Locomotives

and

Marine Harbor Craft

Work to be Done

- Assess availability of CARB diesel fuel in 2007 timeframe
- Complete harbor craft emission inventory
- Complete intrastate locomotive survey
- Prepare emission and cost-effectiveness analyses
- Prepare staff report

Intrastate Locomotives/Harbor Craft: Proposed Evaluation Schedule

- Workshop Schedule:
  - July 27, 2004 (Cal/EPA Sacramento)
  - early September
  - mid-October
- Staff report publication
  - October 1, 2004
- Board Meeting Date
  - November 18-19, 2004